ISSN 1682-8356
ansinet.org/ijps

INTERNATIONAL JOURNAL OF POULTRY SCIENCE

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

OPEN ACCESS International Journal of Poultry Science

ISSN 1682-8356
DOI: 10.3923/ijps.2019.69.75

Research Article
The Effect of Rice Hull in Diets on Performance, Antioxidant Capacity and Blood Chemical Profile of Bali Duck

I.B. Gaga Partama, T.G. Belawa Yadnya, I.G.N.G. Bidura, A.A.A. Sri Trisnadewi and W. Sayang Yupardhi

Faculty of Animal Husbandry, Udayana University, Kampus Bukit Jimbaran, Denpasar, Bali 80361, Indonesia

Abstract
Background and Objective: An experiment was conducted to study the effects of diets with rice hull urea deammoniated and biofermented by a complex of lactobacillus bacteria with *Piper betle L. leaf* supplement on the performance, antioxidant capacity and blood chemical profile of male Bali ducks in the growth phase. **Methodology:** The experiment was a completely randomized design (CRD) with five treatments; the treatments were: (A) control treatment, (B) diet containing 10% rice hull, (c) a diet containing 10% ammoniated and biofermented rice hull, (D) a diet containing 10% rice hull and *Piper betle leaf* and (E) a diet containing 10% ammoniated and biofermented rice hull and *Piper betle leaf*. Each treatment consisted of five Bali ducks and each treatment was replicated four times. Observed variables were consumption and digestibility of diets, final body weight, body weight gain and feed conversion ratio (FCR). **Results:** The results showed that diets containing 10% rice hull ammoniated and biofermented did not affect feed consumption ($p>0.05$), although feed digestibility and final body weight increased ($p<0.05$). However, in these diets, decreases were observed in the levels of total body cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL) and triglyceride (TGA) as well as the levels of sugar and uric acid, whereas weight gain and FCR were not significantly affected ($p>0.05$). Diets containing rice hull deammoniated and biofermented with piper betel leaf supplement decreased concentrations in Bali duck blood. **Conclusion:** In conclusion, diets offered with rice hull urea deammoniated and biofermented supplemented with *Piper betle leaf* improved the performance, antioxidant capacity and blood chemical profile of Bali ducks in the growth phase.

Key words: Antioxidant capacity, bali duck, Piper betle leaf, protein digestibility, rice husk

Received: April 03, 2018 Accepted: October 13, 2018 Published: January 15, 2019

Citation: I.B. Gaga Partama, T.G. Belawa Yadnya, I.G.N.G. Bidura, A.A.A. Sri Trisnadewi and W. Sayang Yupardhi, 2019. The effect of rice hull in diets on performance, antioxidant capacity and blood chemical profile of bali duck. Int. J. Poult. Sci., 18: 69-75.

Corresponding Author: I.B.G. Partama, Faculty of Animal Husbandry, Udayana University, Kampus Bukit Jimbaran, Denpasar, Bali 80361, Indonesia

Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Rice husks are by-products of the rice mills whose primary product is rice. The by-product (rice husk) is produced in abundance because rice is the staple food of Indonesian society. Rice husk as an alternative feed ingredient has a nutrient content of 12.5% water, 3.1% crude protein, 29.2% nitrogen extract (BETN) material, 35% crude fiber, 2.7% fat and 17.5% ash with low digestibility[1]. Rice husk affects the efficiency of ration use and must be fermented to improve the nutritional value[2]. One of the best inoculants used to digest a ration material high in crude fiber is a solution of Effective Microorganisms-4 (EM-4)[3]. The EM-4 solution contains almost 98% cellulolytic enzymes that hydrolyze cellulose into the simple carbohydrate compound glucose. Yadnya *et al*.[4] reported that wood sawdust fermentation with EM-4 solution and urea ammoniation improve the nutrient value of sawdust with the following data: a decrease in crude fiber content from 81.91-48.40% and an increase in crude protein content from 0.90-8.10% and crude fat from 0.32-2.30%. However, the effect of ammonium and biofermentation with the EM-4 solution on the nutritional value of rice husk is uncertain and therefore requires further research, particularly research on ducks among poultry livestock. Ducklings are poultry that easily adapt to the environment; however, the meat contains a relatively high level of fat[5] and therefore, the ration requires supplementation with a material that contains antioxidant compounds, such as betel leaf (*Piper betle* L.). Yadnya *et al*.[6] reported that *Piper betle* L. has a total phenol content and a high antioxidant activity of 1070 mg/100 mL and 97.44%, respectively, compared with the total phenol content and antioxidant activity of noni leaf material of only 33.236 and 27.73%, respectively. Rations that contained 5.97% rice husk that was estered, diametered and supplemented with starbio[7] and urea yielded lower cutting weight than that of the control apparatus but after supplementation with starbio, cutting weight and carcass weight were not affected, although as a percentage of carcass, a significant increase even occurred ($p<0.05$). Sawdust urea diammoniate and EM-4 solution did not affect the performance of moderate Bali ducks[4]. Yadnya *et al*.[8] reported that the replacement of 50% rice bran with rice husk or sawdust supplemented with starpig had no effect on the efficiency of ration use but improved uric acid content in the blood serum of Bali ducks. Yadnya *et al*.[9] reported that giving ducks 5% betle leaves, *Morinda citrifolia* leaves and purple sweet potato leaves improved cholesterol, blood sugar and blood bile. Yadnya *et al*.[10] reported that the provision of *Aspergillus niger* fermented rice husk supplemented with purple sweet potato leaves (*Ipomoea batatas* L.) improved the efficiency of ration use and the lipid profile of duck meat.

This experiment was conducted to study the effects of diets with rice hull urea deammoniated and biofermented by a complex of lactobacillus bacteria and supplemented with piper betle leaf on the performance, antioxidant capacity and blood chemical profile of male Bali ducks in the growth phase.

MATERIALS AND METHODS

Using bio fermentation with a bacterial lactobacillus complex (BLC) and supplementation with betle leaf meal (*Piper betle* L.), the effects of diet were determined on the performance, antioxidant capacity and chemical profile of blood of female ducks in the growth phase. The duck research was conducted in Guwang Village, Sukawati, Gianyar, for 12 weeks. An antioxidant capacity test was conducted at the Analytical Laboratory, Udayana University, at approximately four weeks. Blood chemistry profile was performed in the Animal Feed Nutrition Laboratory of Faculty of Animal Husbandry, Udayana University, at approximately four weeks.

Ducks: The 3-week-old ducks used in the research were obtained from a duck collector from Ketewel Village, Sukawati, Gianyar Regency. The 150 ducks had an initial body weight of 285.80±1.40 g.

Cages and equipment: In this study, a cage two-story battery colony system was used with as many as 21 plots. Each plot was a cage that was 70 cm long, 70 cm wide and 70 cm high. The cage was fitted with foodstuffs and a drinking place made of bamboo slats that were on the outside and was also equipped with a waste container, a reservoir of food scraps and with lights for night lighting.

Ration materials used in this study were yellow corn, soybean, coconut meal, rice bran, rice husk, betel leaf, copra meal, coconut oil, NaCl, urea and rice hull and rice hull fermented by the lactobacillus complex of bacteria. Molasses and EM-4 solution were obtained from the shop product-marketing center Oles in Yang batu Denpasar. Betle leaf was obtained from the Traditional Market Pekraman Guwang, Sukawati, Gianyar.

Biofermentation of rice hull with effective microorganisms-4 (EM-4), urea and molasses: The manufacture of the terammoniated and fermented rice hull was preceded by the preparation of the EM-4 solution comprising one tablespoon of molasses, 1% urea and one spoon of EM-4 solution per liter of water, which was then subjected to a single day treatment. Then, the rice husk was ready for fermentation with the solution for two weeks; the amount of solution mixed with rice husk was previously determined as the point at which when clenched with the hands, solution was not released. The fermented rice husks were put in a vacuum bag under vacuum for one week. Then, the dried, fermented rice husk was ready for use as a feed mixing material[4].

Composition of Rations for Research: Rations consisted of milled corn, soybeans, coconut meal, rice bran, fish meal, vitamin B12, kitchen salt (NaCl) and rice husk. Rice husks were either unprocessed or were fermented with EM-4 solution and supplemented with betel leaf flour (Piper betle L.).

Experimental design: This experiment used a completely randomized design (CRD) with five treatments; the treatments were: (A) the control diet, (B) a diet containing 10% rice hull, (C) a diet containing 10% fermented rice hull, (D) a diet containing 10% rice hull and 0.20% betel leaf meal and (E) a diet containing 10% fermented rice hull and 0.20% betel leaf meal. Each treatment contained five Bali ducks and each treatment was replicated four times.

Variables: The following variables were measured: (a) for performance, feed consumption, nutrient consumption, feed digestibility, nutrient digestibility, body weight gain and feed conversion ratio, (b) feed antioxidant capacity and (c) chemical profile consisting of the lipid profile with total cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL) and triglyceride acid and sugar and uric acid concentrations.

Statistical analyses: The data were analyzed using analysis of variance. When the analysis was significant, Duncan's multiple range test was used to determine which treatment means were significantly different ($p<0.05$)[11].

RESULTS AND DISCUSSION

Feed consumption, feed nutrition, feed digestibility and nutrient digestibility: In treatment A (control), the consumption of ducks that received the ration without rice husk and without betel leaf for 12 weeks was 5,225.19 g duck^{-1} (Table 1-3). Ducks that received the diet with 10% rice husk without fermentation (treatment B) increased consumption of feed, which was not significantly different ($p>0.05$) compared with that of treatment A. For the rations containing 10% fermented rice husk (treatment C), 10% rice hull without fermentation and leaves (treatment D) and 10%

Table 1: Feed composition for ducks (3-10 weeks of age)

	Treatments				
Ingredients (%)	A	B	C	D	E
Yellow corn	55.36	49.98	49.98	49.98	49.80
Soybean	9.37	12.45	12.45	12.45	12.45
Copra meal	11.31	9.82	9.82	9.82	9.82
Fish meal	10.13	8.10	8.10	8.10	8.10
Rice bran	13.26	7.00	7.00	6.80	6.80
Rice hull	-	10.00	10.00*	10.00	10.00*-
Betel leaf meal	-	-	-	0.20	0.20
Coconut oil	-	2.00	2.00	2.00	2.00
Vitamin B12	0.50	0.50	0.50	0.50	0.50
NaCl	0.15	0.15	0.15	0.15	0.15
Total	100.00	100.00	100.00	100.00	100.00

A: Control diet (without rice hull and betel leaf meal), B: Diet containing 10.0% rice hull, C: Diet containing 10% fermented rice hull, D: Diet containing 10% rice hull and 0.20% betel leaf meal and E: Diet containing 10% fermented rice hull and 0.20% betel leaf meal

Table 2: Chemical composition of duck feed (3-10 weeks of age)

	Treatments						
Chemical components	Unit	A	B	C	D	E	Scott *et al.* (1982)
Metabolizable energy	kcal kg^{-1}	2879.17	2826.25	2823.37	2812.49	2826.59	2800-2900
Crude protein	%	17.12	16.32	16.36	16.31	16.38	15-17
Ether extract	%	5.75	6.11	6.23	5.92	5.94	3-6
Crude fiber	%	4.56	7.69	5.40	7.55	5.15	6-9
Calcium (Ca)	%	1.00	0.95	0.96	0.95	0.96	0.80
Phosphorus AV.(P)	%	0.80	0.65	0.52	0.58	0.60	0.45

A: Control diet (without rice hull and betel leaf meal), B: Diet containing 10.0% rice hull, C: Diet containing 10% fermented rice hull, D is the diet containing 10% rice hull and 0.20% betel leaf meal and E: Diet containing 10% fermented rice hull and 0.20% betel leaf meal

Table 3: Effects of fermented rice hull in diets supplemented with betel leaf on feed consumption, nutrient consumption and feed and nutrients digested in bali ducks in the growth phase for 12 weeks

	Treatments					
Variables	A	B	C	D	E	SEM
Feed consumption (g duck^{-1})^{NS}	5.225.19	5321.47	5278.85	5280.85	5277.9	0.2217
Antioxidant capacity (%IC)	3.47^{c}	3.26c^{b}	4.96^{b}	5.10^{a}	5.25^{a}	0.0939
Crude protein consumption (g duck^{-1})	858.15^{b}	1022.04^{a}	911.37^{b}	1064.57^{a}	886.15^{a}	29.45
Fat consumption (g duck^{-1})	842.40^{b}	866.63^{a}	890.24^{a}	713.29^{b}	664.16^{b}	20.53
Crude fiber consumption (g duck^{-1})	1913.38^{a}	2.053,79^{a}	2333.66^{a}	1806.28^{a}	2130.16^{a}	138.90
Energy consumption (kcal kg^{-1} duck^{-1})	17.581^{b}	20.105^{a}	20.385^{a}	18.14^{b}	18.38^{ab}	0.6341

[1]A: Control diet (without rice hull and betel leaf meal), B: Diet containing 10.0% rice hull, C: Diet containing 10% fermented rice hull, D: Diet containing 10% rice hull and 0.20% betel leaf meal and E: Diet containing 10% fermented rice hull and 0.20% betel leaf meal. [2]Values with different letters in the same row are significantly different ($p<0.05$). [3]SEM: Standard error of the treatment mean

Table 4: Feed digestibility and feed nutrition digestibility

	Treatments					
Variables	A	B	C	D	E	SEM
Feed digestibility (%)	72.55^{bc}	70.31^{c}	76.38^{a}	75.88^{ab}	76.68^{a}	1.0160
Crude protein digestibility (%)	69.42^{b}	67.82^{b}	76.14^{a}	70.69^{b}	76.35	1.7400
Crude fat digestibility (%)^{NS}	86.65	87.10	84.27	82.89	84.90	1.2800
Crude fiber digestibility (%)	35.81^{a}	34.52^{a}	42.28^{a}	25.64^{b}	41.22^{a}	2.9000
Energy digestibility (%)	83.89	80.68	85.88	84.62	86.62	5.0892

[1]A: Control diet (without rice hull and betel leaf meal), B: Diet containing 10.0% rice hull, C: Diet containing 10% fermented rice hull, D: Diet containing 10% rice hull and 0.20% betel leaf meal and E: Diet containing 10% fermented rice hull and 0.20% betel leaf meal. [2]Values with different letters in the same row are significantly different ($p<0.05$). [3]SEM: Standard error of the treatment mean

fermented rice husk and betel leaf (treatment E), dietary intake did not increase significantly ($p>0.05$) compared with that in treatment A. The differences among treatments were not significant ($p>0.05$). The consumption of rations was not significantly different because the diets containing betel leaf as an antioxidant could increase metabolic processes including digestion, to meet the requirements for energy and other nutrients.

Consumption of ration nutrients: The consumption of crude protein by ducks in treatment A was 858.15 g head^{-1} for 12 weeks (Table 3). In treatment B, consumption increased by 19.09% ($p<0.05$). In treatments C, D and E, protein consumption increased by 6.20, 24.05 and 3.26% ($p<0.05$), respectively, compared with that in treatment A. Feeding duck with rice husk increased fiber consumption and many rations consumed to meet energy requirements, thus it increased protein consumption. Treatments C, D and E, make th the ration to be more palatable then more ration was consumed in those treatments than in the control treatment.

The consumption of fat and crude fiber by ducks in treatment A was 842.4 and 1912.38 g head^{-1}, respectively (Table 3). In treatments B and C, fat consumption increased significantly ($p<0.05$), whereas in treatments D and E, fat consumption decreased because the addition of betel leaf increased the antioxidant capacity of the ration, leading to reduced fat consumption. The results of this study are consistent with a previous study conducted by Yadnya *et al.*[12] The energy consumption of ducks in treatment A was 17.58 kcal kg^{-1} (Table 3). In treatments B and C, energy consumption increased significantly by 14.36 and 15.95%, respectively ($p<0.05$). By contrast, treatments D and E had no significant effect on the consumption of energy, protein or fat, although in particular, fat consumption decreased, which contains two-fold more energy than carbohydrates or proteins.

Feed digestibility and feed nutrition digestibility: The feed digestibility was 72.55% of treatment A (Table 4). Administration of treatment B decreased the digestibility, although the difference was not significant ($p>0.05$). Administration of treatment D increased the digestibility of the ration by 5.14% ($p>0.05$), whereas treatments C and E significantly increased the digestibility of the ration by 5.27 and 5.69%, respectively ($p<0.05$), compared with the ration in treatment A. Fermentation can help in the digestive process, while antioxidant compounds can inhibit the activity of fatogenic bacteria. So it can be concluded that non-fatogen bacteria can help in the digestive process[13].

In treatment A, the digestibility of protein was 69.42% (Table 4). In treatment B, protein digestibility decreased, although the difference was not significant ($p>0.05$). Treatment C improved protein digestibility, although the increase was not significant ($p>0.05$). Supplementation of betel leaf to rice husk rations in treatments D and E increased protein digestibility by 9.67 and 9.98%, respectively ($p<0.05$), compared with treatment A.

The digestibility of fat and crude fiber rations in treatment A was 86.65 and 35.81%, respectively (Table 4). Provision of fermented rice husk and supplemented betel leaf reduced fat digestibility and increased the digestibility of crude fiber, although the differences were not significant ($p>0.05$) compared with treatment A.

The energy digestibility of treatment A was 83.89% (Table 4). Fermentation and supplementation of betel leaf improved the digestibility of protein, fat and energy. The results of this study are consistent with a previous study conducted by Yadnya *et al.*[9] who reported that the provision of *Aspergillus niger* fermented rice husk and supplementation with purple sweet potato leaves improved the digestibility of dietary rations and nutrients.

Efficiency of ration use: The final body weight of ducks in treatment A was 1320.50 g tail^{-1} (Table 5). Treatment B resulted in a reduced final body weight ($p>0.05$) and treatment D increased the final body weight by 5.81% ($p>0.05$) compared with treatment A, although the differences were not significant. An increase in body weight is ultimately due to the nutritional quality and digestibility of a ration because with an increase in the digestibility of a ration, more nutrients can be absorbed to meet more of the requirements of living ducks[9]. The results of this study are consistent with a previous study conducted by Yadnya *et al.*[9] who found that the provision of fermented rations supplemented with purple sweet potato leaves produces higher final body weights than that of other treatments.

Body weight gain: The body weight gain in treatment A was 1041.9 g duck^{-1} (Table 5). Administration of treatment B decreased body weight gain, although not significantly ($p>0.05$), whereas treatments C, D and E increased body weight by 10.03, 6.48 and 13.12%, respectively. Enzymes contained in the EM-4 Solution[4] and antioxidant compounds in betel leaves increased the digestibility of the ration, similarly reported by Yadnya *et al.*[6] that the effect of fermentation using *Aspergillus niger* and purple sweet potato leaves increased the digestibility of the ration. Based on laboratory research, the antioxidant content of purple sweet potato leaves is 270.62 ppm, whereas that of betel leaf is 124.59 ppm. This causes ducks to consume rations in the form of rice hull fermented with purple sweet potato leaves and added with betel leaves better than ducks that consume rations without added betel leaves. Rice hull which is fermented with added betel leaves will produce a greater FCR compared to purple sweet potato leaves. Additionally, the content of sweet potato leaves was higher in the ration at 1.00%, whereas betel leaf in the ration was at only 0.2%.

Assessment of ferried coupled rice ammoniated and betel leaf dissemination (*Piper betle* L.) on the blood chemical profile of balinese duck females in the growth phase

Blood lipid profile: According to Bidura[2] lipid profiles consist of total cholesterol (TC), high-density lipoprotein (HDL), low-density lipoprotein (LDL) and triglyceride (TGA). Total cholesterol = HDL+LDL+VLDL and Very Low-Density lipoprotein (VLDL) = 1/5 TGA. LDL was obtained as Total Cholesterol-HDL-VLDL. Ducks that received rations without rice husk and without betel leaf (control, treatment A) produced TC (250.29 mg/100 dL), HDL (165.50 mg/100 mL), LDL (64.74 mg/100 mL) and TGA (100.25 mg/100 mL) (Table 6). Administration of treatments B, C, D and E reduced the levels of total cholesterol, HDL, LDL and TGA ($p<0.05$), with only D treatment having no effect ($p>0.05$) on blood TGA (Table 6). Decreased levels of duck blood cholesterol are due to the production of propionic acid[2] with the fermentation of rice husks and the flavonoids and carvokiols in betel leaves, which act as antioxidants and may inhibit the activity of the enzyme 3-Methyl, 3-Hydroxy, Glutaryl-Coenzyme A reductase, thereby reducing the change from Mevalonic Acid to the compound 3 Methyl, 3 Hydroxy, Glutaryl Ko.A. As a result, the distributed cholesterol is reduced, as is the cholesterol accumulated in tissue or inside[14] and the cholesterol in the

Table 5: Efficiency of ration use for ducks fed biofermented rice hull supplemented with betel leaf (3–15 weeks of age)

	Treatments					
Variables	A	B	C	D	E	SEM
Final body weight (g duck^{-1})	1320.5[bc]	1287.0[c]	1445.25[ab]	1397.25[abc]	1463.0[a]	40.4200
Body weight gain (g duck^{-1}) [NS]	1041.90	1001.50	1146.45	1109.45	1178.20	58.3700
Feed conversion ratio (FCR) [NS]	5.02	5.26	4.56	4.78	4.57	0.1962

[1]A: Control diet (without rice hull and betel leaf meal), B: Diet containing 10.0% rice hull, C: Diet containing 10% fermented rice hull, D: Diet containing 10% rice hull and 0.20% betel leaf meal and E: Diet containing 10% fermented rice hull and 0.20% betel leaf meal. [2]Values with different letters in the same row are significantly different ($p<0.05$). [3]SEM: Standard error of the treatment mean

Table 6: Effect of biofermented rice hull in diets supplemented with betel leaf on the blood chemical profile of female balinese ducks in the growth phase

	Treatments					
Variables	A	B	C	D	E	SEM
Sum of cholesterol (mg dL^{-1})	250.29[a]	201.91[b]	197.95[b]	195.64[b]	196.44[b]	2.032
Triglyceride acid (mg dL^{-1})	100.25[ab]	86.50[c]	92.00[c]	102.25[a]	89.50[c]	2.749
High density lipoprotein (mg dL^{-1})	165.50[a]	147.23[ab]	138.50[bc]	125.75[c]	138.25[bc]	6.083
Low density lipoprotein (mg dL^{-1})	64.74[a]	37.36[b]	48.62[b]	49.43[b]	40.29[b]	138.9
Sugar (mg dL^{-1})	176.50[a]	132.75[b]	129.25[b]	128.00[b]	124.25[b]	9.090
Uric acid (mg dL^{-1})	4.600[a]	3.375[b]	3.450[b]	3.00[b]	2.900[b]	0.167

[1]A: Control diet (without rice hull and betel leaf meal), B: Diet containing 10.0% rice hull, C: Diet containing 10% fermented rice hull, D: Diet containing 10% rice hull and 0.20% betel leaf meal and E: Diet containing 10% fermented rice hull and 0.20% betel leaf meal. [2]Values with different letters in the same row are significantly different (p<0.05). [3]SEM: Standard error of the treatment mean

blood is also reduced. The results of this study are in accordance with those obtained by Yadnya *et al.*[9] who found that ducks that received feed of rice husk fermented by *Aspergillus niger* and supplemented with purple sweet potato leaves showed improved lipid profiles in the blood or in Bali duck meat in the growth phase. The lipid profile of the first duck egg in the nesting phase improves when ducks are fed a rice hull ration with *Multienzyme* and supplemented with Noni leaf (*Morinda citripolia* L.).

Sugar and uric acid levels: The sugar content of ducks in treatment A was 176.50 mg dL^{-1} (Table 6). In treatments B, C, D and E, sugars significantly decreased ($p<0.05$) compared with treatment A. An increase in sugar content is influenced by genetic and environmental factors, including the nutritional factor of the ration. Provision of probiotic substances and antioxidant compounds can inhibit the activity of the enzyme α Glucosidase, thereby inhibiting the metabolic formation of glucose, converting it instead into glycogen. Yadnya *et al.*[9] reported that the provision of tubers or purple sweet potato leaves can reduce sugar levels in mice because the leaves or tubers of purple sweet potato produce anthocyanin substances as antioxidants that inhibit the activity of the enzyme α Glucosidase, resulting in a decrease in sugar content in mice. Antioxidants can also stimulate pancreatic activities to produce the hormone insulin, which can improve sugar metabolism and maintain normal blood sugar levels.

The level of uric acid in duck blood was 4,600 mg dL^{-1} in treatment A (Table 6). Rations B, C, D and E significantly lowered the uric acid content ($p<0.05$) compared with that in treatment A. Excessive uric acid in the body can interfere with health, including the metabolic disorder of protein lowering blood sugar and uric acid in duck blood. Yadnya *et al.*[6] reported that purple sweet potato, noni and betel leaf powder reduce blood sugar and uric acid because the alkaloid components inhibit the enzymatic formation of glucose and gout.

CONCLUSION

In conclusion, based on the results of this research, providing rice husk ammoniated and bio-fermented with a lactobacillus complex (BLC) of bacteria and supplemented with betel leaf (*Piper betle* L.) improved the appearance, sugar and uric acid contents and blood lipid profile of females in the growth stage.

SIGNIFICANCE STATEMENT

This study found possible synergistic effects of the combination of fermented rice husk and betel leaf, which was useful for increasing antioxidant capacity, suppressing LDL and HDL, improving the efficiency of ration use and improve the appearance of Bali ducks. This research will enable researchers to reveal the role of fermentation in feedstocks of fiber sources and that of bioactive compounds contained in betel leaves for nonruminant livestock, which are roles that many researchers have not been able to explore.

ACKNOWLEDGMENTS

The authors would like to thank the Directorate General of Higher Education, Ministry of Higher Education, Research and Technology of the Republic of Indonesia for research funds in the University in 2017 through Rector of Udayana University Cq of the Institute for Research and Community Service with contract agreement No: 415.39/UN.4.A/PL/2017, March 30, 2017.

REFERENCES

1. Lubis, D.A., 1992. Animal Feed Science. PT. Pembangunan, Jakarta.
2. Bidura, I.G.N., 2007. Application of Animal Feed Biotechnology Product. Udayana University Press, Denpasar.

3. Yadnya, T.G.B. and A.A.A.S. Trisnadewi, 2011. Inproving the nutrive of purple sweet potato (*Ipomoea batatas* L.) through biofermentasi of *Aspergillus niger* as feed substance containing antioxidant. Proceedings of the 3rd International Conference on Biosciences and Biotechnology, September 21-22, 2011, Bali.
4. Yadnya, T.G.B., N.M.S. Sukmawati and I.K.M. Budiasa, 2007. The effect of chestnut sawmill dissipation and laurel leaves in rations on the appearance, carcass and blood cholesterol levels of Bali ducks. Proceeding of the National Conference, July 24-27, 2007, Gadjah Mada University, Yogyakarta.
5. Setyawardani, T., D. Ningsih, D. Fernando and Arcarwah, 2001. The effect of pineapple and papaya extract on the quality of duck laying ducks. Buletin Peternakan.
6. Yadnya, T.G.B., I. B.G. Partama, A.A.A.S. Trisnadewi, I.W. Wirawan and I G.A.I. Aryani, 2015. The effect of fermented purple sweet potato (*Ipomoea batatas* L.) skin on blood *Malondialdehide* (MDA), sugar and uric acid concentration of bali duck. Int. J. Recent Biotechnol., 3: 1-6.
7. Roni, N.G.K., N.M.S. Sukmawati and N.L.P. Sriyani, 2006. Effect of feeding ration containing rice husked diamoniation supplemented with probiotics against body weight, body fat and chicken broiler chicken. Udayana University, Denpasar.
8. Yadnya, T.G.B. and N.M.S. Sukmadewi, 2006. The effect of substitution of rice bran with rice hull or wood sawdust supplemented with starbio on feed efficiency and uric acid concentration in the blood of Balinese ducK. Majalah Ilmiah Peternakan, Vol. 9, No. 2.
9. Yadnya, T.G.B., A.A.S. Trisnadewi, I.G.A. Aryani and I.G.L. Oka, 2014. Leaves of purple sweet potato (*Ipomoea batatas* L.), Noni (*Morinda citrifolia* L.) and beetle (*Piper beetle* L) in diets improved blood chemical profile of Bali duck. J. Biol. Chem. Res., 31: 538-545.
10. Yadnya, T.G.B., I.B.G. Partama and A.A.A.S. Trisnadewi, 2012. The effect of rationing containing purple sweet potato (*Ipomoea batatas* L.) *Aspergillus niger* fermented to the digestibility of rations, protein retention and addition of weight of Bali ducks. Proceedings of the FAI 2012, National Conference, (FAI'12), Mercu Buana University, Yogyakarta.
11. Steel, R.G.D. and J.M. Torrie, 1989. Priciples and Procedure of Statistic. McGraw Hill Book Co. Inc., New York.
12. Yadnya, T.G.B., A.A.A.S. Trisnadewi, I.K. Sukada and I.G.L. Oka, 2016. The effect of offered diet containing rice hull and Mono Sodium Glutamat (MSG) and effective microorganism-4 (EM-4) solution on the performance of Campbell duck. Int. Res. J. Eng. IT Scient. Res., 2: 66-72.
13. Yadnya, T.G.B., N.M.S. Sukmawati and I.W. Wirawan, 2013. The utilization of purple sweet potato leaves in starpig supplemented ration against colesterol serum blood and Bali duck carcass. Proceedings of the FAI 2012, National Conference, (FAI'12), Mercu Buana University, Yogyakarta .
14. Rao, A.V. and S. Agarwal, 2000. Role of antioxidant lycopene in cancer and heart disease. J. Am. Coll. Nutr., 19: 563-569.